DOCUMENT RESUME

ED 172 802 IR 007 436

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TITLE Effect of Cartoon Illustrations on the Comprehension and Evaluation of Information Presented in the Print and Audio Mode.
PUB DATE Mar 79
NOTE 22p.; Paper presented at the Annual Convention of the Association for Educational Communications and Technology (New Orleans, Louisiana, March 1979); For related document, see IR 007 416

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Audiotape Recordings; *Audiovisual Aids; *Cartoons; Cognitive Processes; College Students; *Comprehension; Illustrations; *Intermode Differences; Library Guides; *Media Research; Sex Differences; Slides

ABSTRACT

This study investigates the effects of cartoon illustrations on female and male college student comprehension and evaluation of information presented in several combinations of print, audio, and visual formats. Subjects were assigned to one of five treatment groups: printed text, printed text with cartoons, audiovisual presentations, audio only presentations, and visual only presentations. Following the informative presentation, each subject completed a 25-item comprehension test and measures of self-reported enjoyment and helpfulness. The results indicated that there were no significant differences between the printed text, the cartoon text, and the audiovisual presentation in terms of comprehension scores. The cartoon text was perceived as significantly more enjoyable than any other presentation mode. There was a significant interaction between sex and presentation mode with males scoring significantly lower on comprehension in the cartoon text condition. A list of references and two data tables are attached. (Author/RAO)

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Effect of Cartoon Illustrations on the Comprehension and Evaluation of Information Presented in the Print and Audio Mode

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Research and Theory Division

Association for Educational Communications & Technology

New Orleans, Louisiana

March 1979

IR007436

ABSTRACT

The study was designed to investigate the effects of cartoon illustrations on female and male college student comprehension and evaluation of information. Subjects were assigned to one of five treatment groups as follows: (1) printed text, (2) printed text with cartoons, (3) audio-visual presentation, (4) audio only presentation, and (5) visual only presentation. Following the informative presentation, each subject completed a 25-item comprehension test and measures of self-reported enjoyment and helpfulness. The results indicated that there were no significant differences between the printed text, the cartoon text, and the audio-visual presentation in terms of comprehension scores. The cartoon text was perceived as significantly more enjoyable than any other presentation mode. There was a significant interaction between sex and presentation mode with males scoring significantly lower on comprehension in the cartoon text condition.

Effect of Cartoon Illustrations on the Comprehension and Evaluation of Information Presented in the Print and Audio Mode

The use of visual humor in the form of cartoon illustrations is a familiar characteristic in many college textbooks (see for example Hance, Ralph, & Wiksell, 1962; Rein, 1972; and Larson, 1979), and the use of cartoon humor as an instructional technique in the classroom has also been given considerable attention (see Adams, 1974; Brooke, 1973-74; Neie, 1973; and Miner, 1969). The focus of this attention, however, has usually been motivational in its orientation with little evidence advanced to support any positive effects on learning as a result of the use of the cartoon humor. Studies have, in fact, found that the use of humor in most contexts does not result in information gains (Gruner, 1976, pp. 301-304).

In a recent discussion of cartoon humor in magazines, John Peter (1978), a publications consultant and past art director for McCall's, advanced four arguments for the use of cartoons: (1) high readership, (2) enjoyment, (3) increases the visual element, and (4) provides an identity for the publication. In his discussicn of these advantages, Peters makes specific reference to the effect of cartoons on reader abilities to remember the content of cartoons, thus suggesting a learning effect.

The present study was designed to investigate the effect of cartoon illustrations on the comprehension and evaluation of information presented in combinations of the print, audio, and visual mode.

Though there has been a significant amount of research investigating the effect of presentation mode on learning, no clear conclusions can be stated

based on the research findings (see Hsia, 1971, and Dwyer, 1978 for reviews of the theory and research). One possible reason for the lack of consistent and interpretable results is that such a wide variety of cueing variables are used. A primary function of cueing is to ensure that the intended instructional stimuli are attended in such a way that they can be easily stored in memory and recalled at a later time (see Dwyer, 1978, pp. 152-175 for a review of the theory and research on cueing).

Cartoons serve a cueing function, but little research has centered on the use of cartoons as a means of facilitating learning. Lumsdaine & Gladstone (1958) used cartoons and humorous auditory material in a slide-film technique to teach phonetic alphabet symbols. The introduction of the cartoons and auditory humor resulted in decreased learning.

The use of cartoons in a slide-tape presentation was studied by Baker & Popham (1965) and Popham (1969). Measures of both comprehension and affective reactions were included in the studies, and no comprehension differences were found between presentations with cartoons and those without cartoons. In the second study, affective reactions did favor the cartoon presentation.

Kauffman & Dwyer (1974) studied the use of cartoons and photographs in in-service training. Cartoons were more effective than realistic photographs in facilitating both immediate and delayed retention of information. In addition, a majority of the subjects indicated that they learned more from the cartoon presentation and would prefer to receive cartoon illustrated instruction rather than photographic illustrated instruction.

Using a programmed instructional package with one version containing cartoon supplements, Freisinger (1976) found no differences on either skill performance or affective responses to the subject matter or presentation format.

The effect of the sex of the learner has been almost totally neglected in studies of the relationship between presentation mode and learning. In the one study which used high school or adult subjects and focused on the effect of sex, Dwyer (1971) found no differences in learning from several types of visual presentations.

The present study attempted to investigate (1) the effect on the comprehension and evaluation of information presented in several combinations of print, audio, and visual formats, (2) the effect of the sex of the learner on the comprehension and evaluation of information presented in several combinations of print, audio, and visual formats, and (3) any interactions between presentation mode and sex of the learner.

METHOD

Subjects. Subjects were 150 student volunteers enrolled in several sections of basic communications classes as Virginia Polytechnic Institute and State University. Half the subjects were female, and half were male. While no coursework credit was given for participation in the study, the students were told that if their final grade average in the course was borderline, they would be given the higher grade in the final averaging.

Materials. The materials developed for use in this study were (1) a basic text, (2) an audio recording of the basic text, (3) cartoons based on the basic text, and (4) slides of the cartoons.

A basic text, "The Library at Virginia Tech," was developed from information available in the library as well as with the aid of several members of the library staff. The text described four keys helpful in unlocking the resources of the library.

An audio cassette recording was made of a female reading the basic text.

No attempt was made to provide vocal variety in the recorded version other than that normally associated with a person reading informative material aloud.

A series of forty-three cartoons was created and drawn by a student whose cartoons appeared in each issue of the campus newspaper. The cartoons, which featured characters from one of his regular strips, were created specifically for this study to accompany the content of the basic text. Black-and-white slides were made from each of the forty-three cartoons.

Treatments. Subjects received one of five experimental treatments. The first treatment was a simple printed copy of the basic text. The booklet looked like a handout one might receive in a class or upon entering the library (see Appendix C for some sample pages). The booklet was seven double-spaced pages, and there were no visuals or headings to provide visual cues about changes in the subject content.

The second treatment was a booklet which combined the basic text with the forty-three cartoons (see Appendix C for some sample pages). This booklet was eighteen pages in length.

The third treatment was an audio-visual presentation which consisted of the audio recording of the text cued to the slides of the cartoons. The total presentation was presented by means of a slide projector connected to a cassette recorder.

The fourth treatment was the audio recording alone, and the fifth treatment was the slide presentation alone.

Dependent Variables. There were three dependent variables in the study. A 25-item multiple-choice comprehension test over the contents of the basic text was developed to measure subject comprehension.

Ten bipolar adjective pairs were used to measure affective responses to the presentation. Factor analysis suggested that there were two well defined factors which were then used as separate affective measures. One factor, called "Enjoyment," contained six adjective pairs (exciting/boring, interesting/dull, humorous/serious, enjoyable/unenjoyable, happy/sad, and unusual/ordinary). The second factor, "Helpfulness," contained three adjective pairs (helpful/unhelpful, informative/uninformative, and worthwhile/worthless).

Procedures. Subjects were randomly assigned to treatments with equal female and male representation in each treatment. The presentations were in the evening with order of presentation being randomly determined.

Subjects were told that they were to read/watch/listen to an informative presentation on the library, and after the presentation they would be tested over the presentation. Time was controlled so that all subjects were given equal time between the beginning of the presentation and the time at which the test was administered. Since those subjects reading the printed texts worked at their own pace, they were instructed to close their booklets when they had read the complete text once.

Statistical Analysis. A 2 x 5 multivariate analysis of variance was performed with two levels of sex and five treatment levels; comprehension scores, self-reported "Enjoyment," and self-reported "Helpfulness" were the dependent variables. Following significant multivariate tests, univariate F ratios were calculated, and following significant univariate tests, multiple comparisons using the Scheffé method were computed.

The .05 level of significance was required for all tests, and the significance level is reported with each separate analysis.

The statistical analyses were performed using programs from both SAS (Barr, et. al., 1976) and SPSS (Nie, et. al., 1975).

RESULTS

The reliability of the comprehension test, determined by the KR-20 formula, was found to be 0.78.

The results of the factor analysis discussed earlier is presented in Appendix A. One of the ten bipolar items did not fall into either factor, and was thus not used in any further statistical analysis.

The intercorrelations of the three dependent measures are presented in Table 1. Intercorrelations between Comprehension and Enjoyment, and between Enjoyment and Helpfulness were significant. Comprehension and Helpfulness were not significantly related.

Table 1
Intercorrelations of Dependent Measures

Measure	Comprehension	Enjoyment	Helpfulness
Comprehension	1.000		
Enjoyment	0.276*	1.000	
Helpfulness	0.086	0.338*	1.000

*$p < .01$

Analysis of Variance. The multivariate analysis of variance was used to determine the main effects of presentation mode and sex on the three dependent measures. Univariate analysis of variance was used when the multivariate analysis was significant, and when the univariate analsysis was significant, post hoc analysis of pairwise comparisons was performed using Scheffe.

The raw cell means on the three dependent measures are presented in Appendix B.

The main effect of sex was not significant. The main effect of presentation mode was significant, multivariate $F(12,365)=14.94$, $p<.001$. Univariate F ratios were computed to assess the individual significance of the three dependent measures. All three of the univariate F ratios were significant at $p<.001$: for Comprehension, $F(4,149)=28.27$; for Enjoyment, $F(4,149)=10.88$; for Helpfulness, $F(4,149)=6.31$.

The sex x presentation mode interaction was significant. The multivariate overall effect was $F(12,365)=2.18$, $p<.01$. Only one of the univariate F ratios, for Comprehension, $F(4.149)=4.49$, was significant at $p<.01$.

Post Hoc Analysis. The differences among means for the two dependent variables with significant differences as computed using Scheffe are presented in Tables 2 and 3.

The differences between the printed text, cartoon printed text, and audio-visual presentation were not significant for Comprehension. The printed text and cartoon printed text means were significantly greater than the means for the audio and the visual presentations, and the means for the audio-visual and audio presentations were significantly greater than the mean for the visual presentation.

On the Helpfulness measure, the differences between printed text, cartoon printed text, audio-visual presentation, and audio presentation were not significantly different. Self-reported Helpfulness was significantly lower on the visual presentation than on any other treatment condition.

While there were no significant differences on the Enjoyment measure when using the Scheffe procedure, there were differences when using the Tukey LSD procedure. These differences are reported in Table 4. The cartoon printed text was perceived as significantly more enjoyable than the printed text, the audio presentation, and the visual presentation.

Table 2

Differences Among Means on Comprehension
Scheffé Procedure

		Printed Text	Cartoon Text	Audio-Visual	Audio Only	Visual Only
Printed Text	87.9	---	2.6	7.9	11.9**	24.7**
Cartoon Text	85.3		---	5.3	9.3*	22.1**
Audio-Visual	80.0			---	4.0	16.8**
Audio Only	76.0				---	12.8**
Visual Only	63.2					---

*$p<.05$
**$p<.01$

Table 2

Differences Among Means on Helpfulness
Scheffé Procedure

		Audio Only	Cartoon Text	Audio-Visual	Printed Text	Visual Only
Audio Only	11.3	---	0.8	0.8	0.9	2.9**
Cartoon Text	10.5		---	0.0	0.1	2.1*
Audio-Visual	10.5			---	0.1	2.1*
Printed Text	10.4				---	2.0*
Visual Only	8.4					---

*$p<.05$
**$p<.01$

Following the significant Sex x Presentation Mode interaction, the t-test was used for individual comparisons between the means. The nature

of the interaction is ploted in Figure 1. On comprehension, females ($\bar{X}$=91.467) scored significantly higher than males ($\bar{X}$=79.200) in the Cartoon Text treatment.(t=3.11, df=28, p<.01). In one other treatment condition, Visual Only, male comprehension scores ($\bar{X}$=66.667) were significantly higher than female comprehension scores ($\bar{X}$=59.733) with t=-2.09, df=28, p<.05.

Table 4

Differences Among Means on Enjoyment
Tukey LSD Procedure

		Cartoon Text	Audio-Visual	Printed Text	Visual Only	Audio Only
Cartoon Text	9.3	---	1.3	1.5*	1.8**	4.3**
Audio-Visual	8.0		---	0.2	0.5	3.0
Printed Text	7.8			---	0.3	2.8
Visual Only	7.5				---	2.5
Audio Only	5.0					---

*p<.05
**p<.01

DISCUSSION

Of primary importance was the finding that there were no significant differences between the printed text, the cartoon text, and the audio-visual presentation in terms of the comprehension of the content. This result would seem to lend support to studies such as Van Mondfrans & Travers (1964) and Main & Griffiths (1977) which have found that information can be just as easily processed in one of several sensory modalities or combination of modalities.

Additionally, the two printed formats (without and with cartoons) resulted in significantly better comprehension than either the audio or the visual presentation, and the visual presentation resulted in significantly less comprehension than any other presentation mode. The inability of the visual presentation should come as no surprise since it was lacking in the

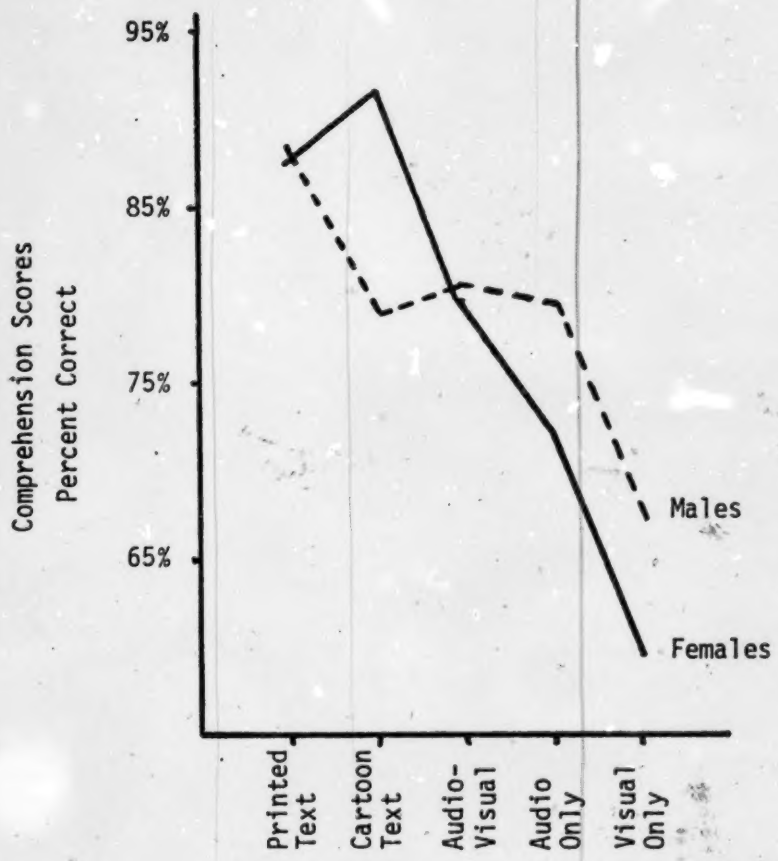

Figure 1
Sex x Presentation Mode Interaction

essential information available in the other four presentation modes. It served mainly as a control group.

A lack of any relationship between the perceived helpfulness of a presentation and actual comprehension was demonstrated by the lack of any significant differences on self-reported Helpfulness in any condition but the visual presentation.

The cartoon text was perceived as significantly more enjoyable than any other presentation mode. This result does not support Freisinger's (1976) finding that the addition of a cartoon embellishment resulted in no affective differences. The difference between the two studies could come from a variety of sources. For one thing, the cartoons used in the present study were to some degree "student tested" in that the characters were familiar to the student population being studied since they appeared in a regular cartoon strip in the student newspaper. The nature of the cartoons used in the Freisinger study were not specified.

Of great interest was the significant interaction between Sex and Presentation Mode, accounted for by differences in comprehension scores. To hypothesize that the males were distracted by the cartoons would go against a fairly stable body of research on distractability (see Halley, 1975 for a review of some of this literature). One possible explanation worth further exploration might be that the males were indeed not "distracted" by the cartoons in the printed text, and as a result they missed visual imagery cues which could have been used to recall specific information. This would account for their slightly better performance in the audio-visual condition since the slides of the cartoon were not spatially related to the informative presentation. When only one sensory modality was used, males scored the same as females (printed text) or higher than females (audio and visual only).

In summary and conclusion, the results of the present study would seem to suggest that if comprehension is the only goal of instruction, the less expensive printed text is just as effective as the more expensive illustrated text or audio-visual presentation. If, however, there is a concern for

the student to enjoy the presentation while learning the information, there is some support for the value of the cartoon illustrated text. The overall equality of the printed text, cartoon illustrated text, and audio-visual presentation would seem to make final choices largely a matter of personal preference and budget limitations.

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APPENDIX A

Results of Factor Analysis

	Factor I	Factor II	h^2
exciting/boring	.842*	.156	.73
interesting/dull	.853*	.173	.76
humorous/serious	.689*	-.301	.57
enjoyable/unenjoyable	.856*	.147	.75
happy/sad	.697*	.112	.50
unusual/ordinary	.768*	-.112	.60
helpful/unhelpful	.045	.907*	.83
informative/uninformative	-.045	.871*	.76
worthwhile/worthless	.233	.762*	.64
involving/uninvolving	.591	.304	.44
Proportional contribution to common variances	4.128	2.447	

The analysis was a principal components with varimax rotation. Each factor was required to have at least two items loaded at .600 or above with no secondary loadings at .400 or above.

APPENDIX B

Cell Means

		Female	Male	Row Means
Printed Text	Comprehension	87.467	88.267	87.867
	Enjoyment	7.267	8.400	7.833
	Helpfulness	10.600	10.134	10.367
Printed Cartoon Text	Comprehension	91.467	79.200	85.333
	Enjoyment	9.200	9.467	9.333
	Helpfulness	10.867	10.134	10.500
Audio-Visual Presentation	Comprehension	79.467	80.533	80.000
	Enjoyment	8.000	8.000	8.000
	Helpfulness	10.333	10.667	10.500
Audio Only Presentation	Comprehension	72.000	79.200	76.000
	Enjoyment	5.333	4.600	4.967
	Helpfulness	11.800	10.733	11.267
Visual Only Presentation	Comprehension	59.733	66.667	63.200
	Enjoyment	6.667	8.333	7.500
	Helpfulness	7.733	9.000	8.367
Column Means	Comprehension	78.187	78.773	
	Enjoyment	7.293	7.760	
	Helpfulness	10.267	10.133	

APPENDIX C

Samples of the Printed Texts

THE LIBRARY AT VIRGINIA TECH

The Newman Library at Virginia Tech is there to serve the needs of the students and faculty by providing the tools for the basic instruction and research needs of the university community.

To help you more effectively and efficiently use the resources of the library, we would like to introduce you to several valuable keys which can help unlock the mysteries of the library. There are four major keys we will talk about.

First is the key to knowing where to locate the books and periodicals you will need.

Second is the key known as the card catalog system.

Third is the key known as the library classification systems.

Finally, there is the key to some rules and services which help to make the library a better place for you and everyone else.

Let's begin with that first key--location of books and periodicals.

You should know that in addition to the main Newman Library, there are two branch libraries with books and other materials in specialized subject areas. The books and resource materials in branch libraries are for the use of all students.

The Architecture Library is located in Cowgill Hall and contains materials about architecture and visual arts. All the books in the Architecture Library are catalogued in the main library, but after the usual call number, you will find the abbreviation ARCH.

You will find the Geology Library in Derring Hall. Not

everything in this branch library is written on rock. All the books and learning resources located in the Geology Library are also catalogued in the main card catalog of the Newman Library, but after the call number you will find the abbreviation GEOL.

Most of the books, of course, are located in the main Newman Library, and we will focus most of our attention on finding books and periodicals there.

In the main library there are three subject divisions: Humanities, Social Science, and Science and Technology.

Humanities books and periodicals are located on the 1st and 2nd floors of the Newman Library. Here you will find books and periodicals which provide you with information about philosophy and religion, history, music, language and literature, theatre, and communications.

Books about Van Gogh, Matisse, Bach, Beethoven, McLuhan, and Kierkegaard will be found in the Humanities.

Did you know that the library receives newspapers from around the world as well as from across the U.S. and the Commonwealth of Virginia? These newspapers are available in the Humanities Division of the 2nd floor.

Books and periodicals in Science and Technology are located on the 3rd floor of Newman Library. Here you will find information about the natural sciences, medicine, agriculture, technology, mathematics, and military science. This is the place to come if you need a solution to that impossible equation, or have you ever thought of building your own bridge?

The Social Science Division is located on the 4th floor and contains books and periodicals about psychology, law, geography, anthropology, political science, sociology, business, and education.